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Case Report

Surgical Treatment for Saccular Abdominal Aortic Aneurysms Involving the Renal Artery Origin: Report of Two Cases

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We successfully treated small saccular abdominal aortic aneurysms involving the renal artery origin with direct sagittal suture closure under supra-celiac or supra-superior mesenteric artery cross clamping after renal artery reconstruction in two cases. This technique might be a useful option for localized saccular aortic aneurysms in selected cases.

Keywords: AAA (abdominal aortic aneurysm), pararenal, saccular aneurysm

Introduction

Optimal treatment for small and localized saccular abdominal aortic aneurysms involving the renal artery origin remains a matter of debate, because standard prosthetic replacement of a pararenal aortic aneurysm is an invasive procedure and its application for such a tiny lesion seems to aggressive. We used direct sagittal suture closure of an aneurysm under brief period of supra-celiac or supra-mesenteric cross-clamping after renal artery reconstruction in two such cases. Merits and demerits of this technique are discussed.

Case Report

Case 1

A 76-year-old man was referred to our department for surgical treatment of multiple aneurysms involving the juxtarenal abdominal aorta and bilateral common and internal iliac arteries. He also had a small localized saccular aortic aneurysm involving the right renal artery origin (**Fig. 1**). Maximum diameter of the right common iliac artery aneurysm was 62 mm.

Operation was performed through a midline transperitoneal approach. We opened the lesser omentum to expose the supra-celiac aorta. The right renal artery and the pararenal saccular aortic aneurysm were exposed by mobilizing the duodenum to the left (Kocher's maneuver). Epi-aortic echo around the pararenal saccular aneurysm showed no severe thickening of aortic wall and no protruding or mobile atheroma. The juxtarenal abdominal aortic aneurysm and iliac artery aneurysms were treated first with suprarenal aortic crossclamping. A 20 ×10 × 8 trifurcated graft (Intervascular; Massachusetts, USA) was used to reconstruct the right internal iliac artery. Then bypass was created from the prosthetic graft to the right renal artery using a saphenous vein graft. Renal ischemic time was 25 min. Finally, a clamp was placed on the supra-celiac abdominal aorta. The small saccular aneurysm was suture closed sagittally in two layers by 4-0 monofilament mattress and running sutures with a Teflon felt strip reinforcement. Supra-celiac cross clamping time was 10 min.

Postoperative course was uneventful. There was no deterioration in renal function. Post-operative computed tomogram revealed satisfactory reconstruction

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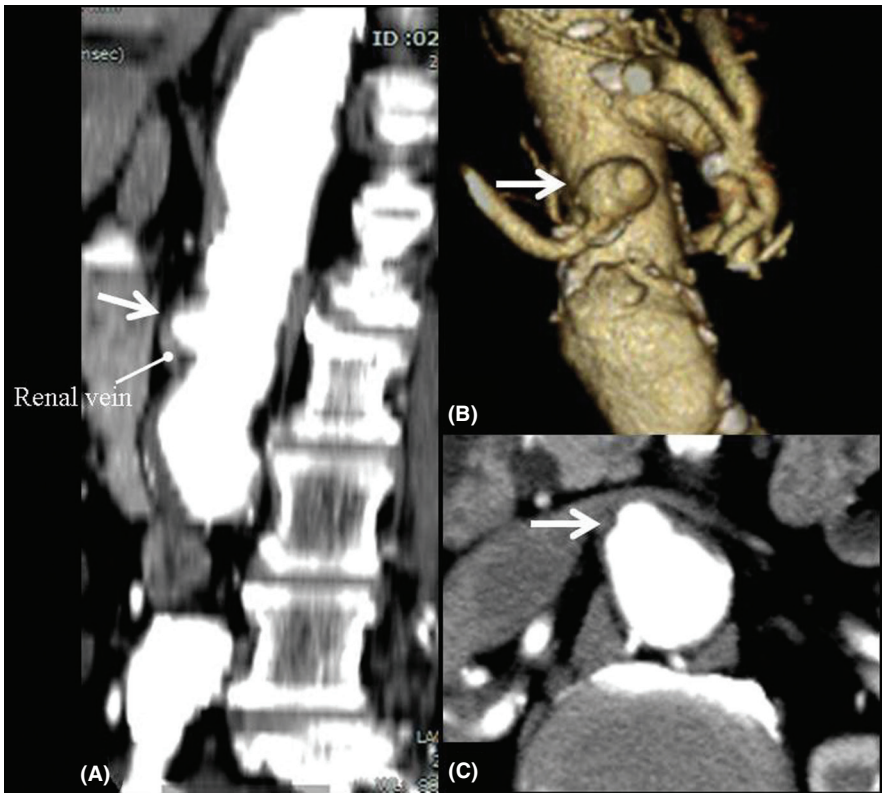

Fig. 1 Preoperative computed tomograms. White arrow indicates the saccular pararenal aortic aneurysm involving the origin of the right renal artery. (**A**) Three-dimensional multi-planar reconstruction showing multiple aneurysms in the aorto-iliac segment. (**B**) Lateral view of the magnified image showing the saccular aneurysm involving right renal artery. (**C**) Axial tomography showing no protruding atheroma around the aneurysm and no severe thickening of the aortic wall.

(**Fig. 2**). The patient was discharged on 17th post-operative day. During the follow-up period, no aortic complication had been detected until he died of interstitial pneumonitis 10 months after operation.

Case 2

A 65-year-old woman was admitted to our department for gradual enlargement of a saccular aortic aneurysm involving the origin of the left renal artery (**Fig. 3A**). She had undergone graft replacement for an infrarenal abdominal aortic aneurysm 4 years ago.

Operation was performed through a thoracoabdominal incision supplemented by a partial circumferential division of the diaphragm. Epi-aortic echo around the pararenal saccular aneurysm showed no severe thickening of aortic wall and no protruding or mobile atheroma. First, reconstruction of the left renal artery was performed using the great saphenous vein. Proximal anastomosis of the vein graft was created to the previous prosthetic graft in an end-to-side fashion, which was followed by the distal end-to-end anastomosis between the transected left renal artery and the vein graft. Then the small saccular aneurysm was suture closed sagittally in two layers by 4-0 monofilament mattress and running sutures with a Teflon felt strip reinforcement during supra-mesenteric cross-clamping for decompression. Left renal ischemic time and supra-mesenteric cross-clamping time were 15 min and 8 min, respectively.

Postoperative course was uneventful. Renal function remained unaltered. Post-operative CT revealed good arterial reconstruction and disappearance of saccular aneurysm (**Fig. 3B**). She was discharged on the 11th post-operative day, and is currently doing well without aortic complication 16 months after the operation.

Discussion

Therapeutic strategy for aortic aneurysms involving the major abdominal branches has been a matter of

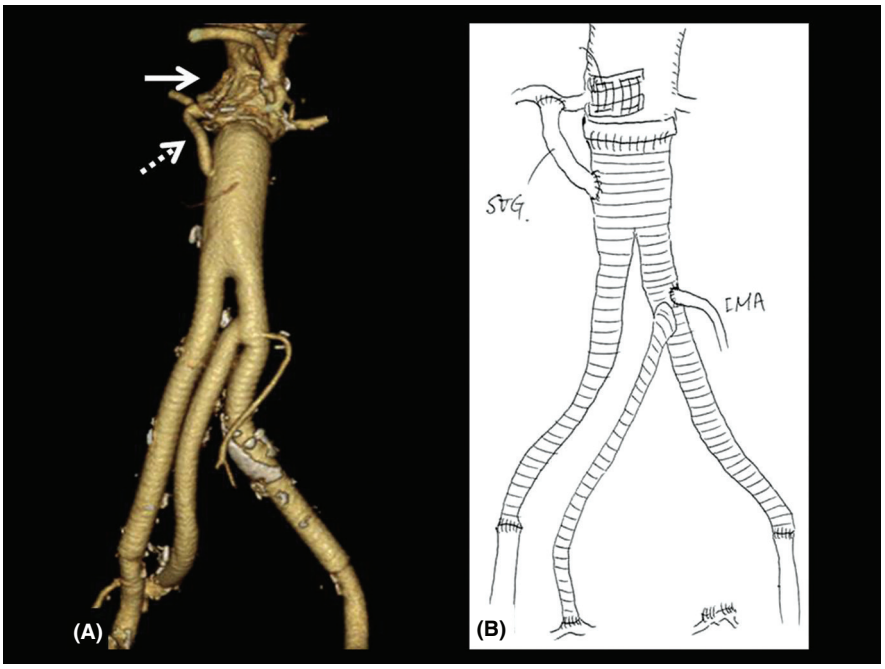

Fig. 2 Postoperative three-dimensional computed tomograms. (**A**) White arrow indicates the line of suture closure of the pararenal saccular aneurysm. Dotted arrow indicates the bypass graft. (**B**) Operative schema.

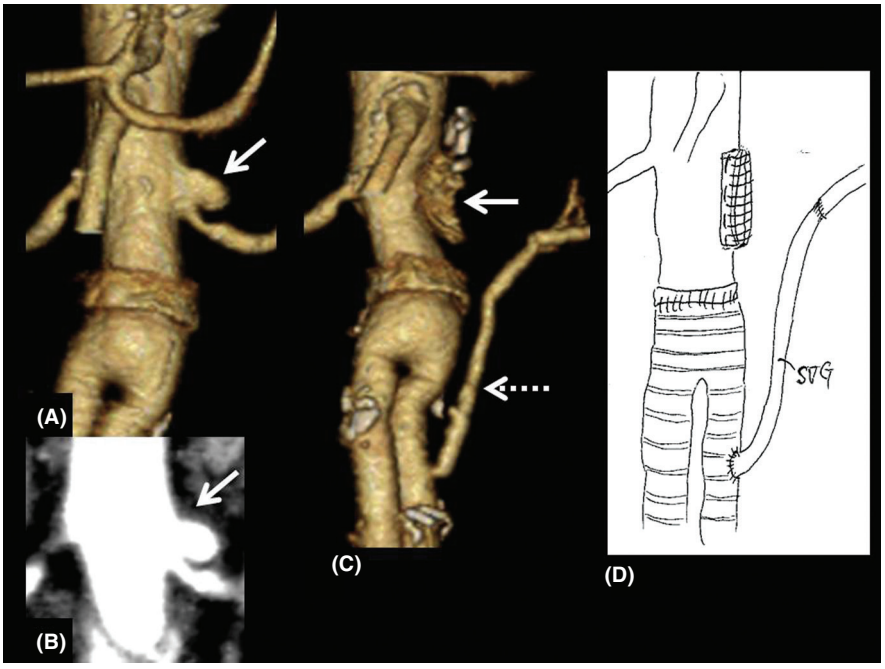

Fig. 3 Computed tomograms before (**A, B**) and after (**C**) operation. White arrow indicates the saccular aneurysm (**A, B**) and the line of suture closure (**C**). Dotted arrow indicated the left renal artery reconstruction with a vein graft. No protruding atheroma around the aneurysm was found in the coronal (**B**) sections. (**D**) Operative schema.

contention, especially in this era of endovascular intervention. Although graft replacement is generally applied for aneurysmal diseases of the aorta, we found ourselves in certain dilemma to pursue such treatment strategy in these two cases with the small saccular lesions. We have performed 27 cases of throracoabdominal aortic replacement and four cases of pararenal abdominal aortic replacement

with renal artery reconstruction in the last four year period with no mortality, and these 31 cases included patients with much higher operative risk than that of the present two cases. Nevertheless, we were not sure if such an extensive reconstruction would be justified for these localized small saccular aneurysms, given the highly invasive nature of the procedure. Treating saccular aortic aneurysm around the origin of the visceral arteries by direct suture closure technique has been reported. Bahnson, et al. reported tangential resection and primary closure for saccular aneurysm of the upper abdominal aorta in 1953.[1] Haimovici, et al. also reported similar tangential resection and primary closure with implantation of the CA to the iliac artery in 1964.[2] However, since the advent and widespread availability of Dacron grafts for the aorta,[3,4] these techniques have been rarely practiced. The only situations where such techniques are still applied are probably ascending aortoplasty,[5] or repair of chronic type B aortic dissection to preserve multiple intercostal arteries.[6] Robicsek and colleagues have used wrapping in addition to reduction aortoplasty of the ascending aorta.[5] We did not use it because the benefit of wrapping has not been proven, and the wrapping in this position was difficult because there was renal artery on the opposite side.

Such a technique may be criticized because of the possibility of re-dilatation and suture line false aneurysms. The rationale for adopting this less invasive technique in these two cases was the absence of severe atheromatous changes in the aortic wall around the saccular aneurysm. This important information was provided by preoperative enhanced computed tomographic imaging and epi-aortic echo during operation, which we think is indispensable in selecting appropriate patient for this technique. It is also important to note that suture closure was performed in two layers with a Teflon felt reinforcement under decompression, which was accomplished by aortic cross-clamping above the celiac axis or the superior mesenteric artery. Although this is accompanied by visceral and renal ischemia, the procedure could be completed within 10 min, and blood loss was minimal because the aorta was not open.

We performed renal artery reconstruction before aneurysm plication, so that renal ischemia time could be minimized. However, it may be better to suture close the aneurysm first to avoid possible embolic event to the kidney.

Endovascular insertion of a branched stent-graft was a possible treatment option in these cases.[7,8] However, as the landing zone was limited, multi-branched stent-graft would be required even for these small lesions, which is still a challenging procedure. With instrumental and technical refinements, these lesions would be amenable to endovascular treatment in the future.

Conclusion

This suture closure technique might be a useful treatment option for localized saccular aortic aneurysms in appropriate cases. Although early results are good, the patients must be carefully followed for long term results.

Disclosure Statement

The authors have no conflict of interest.

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